BP GoM: Next Generation Offshore Fiber

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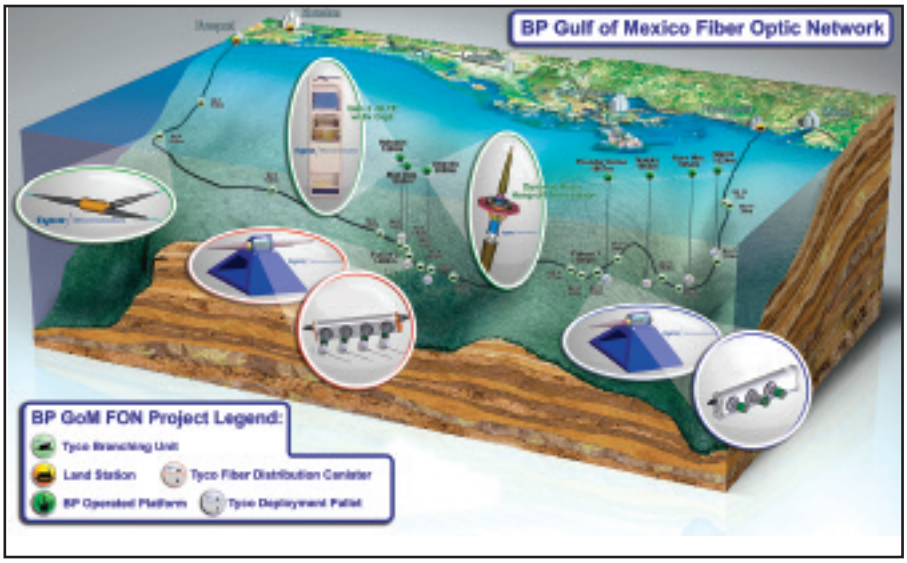
The deployment of undersea fiber to offshore platforms has been talked about for years. The attractions of near-unlimited bandwidth, low latency, improved reliability and robustness were expected to trump fiber's perceived high first cost and lack of ubiquity when compared to traditional microwave and satellite solutions. With a few notable exceptions, however, fiber to platforms remained a concept. Operators struggled with the fiber business case and ownership model, while suppliers pushed traditional telecom solutions such as satellite and microwave.

This all changed when BP decided to build a Fiber Optic Network in the Gulf of Mexico for many of its platforms to improve flow of data to its onshore data center (BP GoM FON). A major infrastructure investment aimed at increasing productivity and reliability in the hurricane prone Gulf, the BP GoM FON is now deployed, fully operational and sets an industry standard for undersea fiber applications to offshore oil and gas platforms.



A Little History

Petrobras, the Brazilian oil and gas major, deployed a non-repeatered fiber optic system linking six fixed platforms in a ring along with two deepwater floating platforms configured as spurs off the ring in 1999 and has been in successful operation ever since. The key technology advance for the system was the development of dynamic fiber optic risers for the deepwater platforms. Otherwise, the system utilized traditional short haul fiber optic technology. Two shallow water systems of similar vintage were deployed in the North Sea and a Third in Azerbaijan.

Gulf of Mexico operators have been considering fiber solutions since the mid 1990s. With the development of oil fields in deeper waters and installation of larger platforms, new telecommunications requirements were identified. The demand for bandwidth was growing but geographic diffusivity argued against the high cost of fiber to an individual or multiple platforms, especially when a producer's platforms might be tens or hundreds of kilometers apart. Independent telecom operators attempted to develop solutions and enlist producers that would commit to buying a service on long-term contracts in order to finance an open access system. As a result of market and industry constraints, these solutions were never realized.

Hurricanes Dennis, Katrina and Rita in the summer of 2005 changed everything. Platforms in the storms' paths had communications failures or worse. Many platforms not directly in the hurricanes' paths, including some deepwater, high-value platforms, were impacted in their ability to restore to normal operations because their communications links were dependent upon impacted nearshore platforms. Every day of downtime costs millions in lost production.

BP Takes the Plunge

BP, one of the major Gulf of Mexico producers with some of the most significant deepwater platforms on line and on the drawing board saw an opportunity to improve operational efficiencies through the implementation of more reliable communications with minimal platform interdependences. BP also had significant initiatives for using digital information to manage offshore operations collaboratively with teams ashore. The confluence of these events were considered in BP's decision to construct the BP GoM FON, an advanced undersea fiber optic network designed to provide connectivity from offshore platforms to the BP operations center in Houston in a self-healing ring architecture. BP wanted a system that could serve existing deepwater platforms, but also include the flexibility to be expanded and extended to accommodate future platforms. The 2005 hurricanes demanded a design emphasis on robustness and reliability. No interdependencies, especially power management, between primary platform nodes would be tolerated.

Undersea Telecom Meets Offshore Oil and Gas

Advanced undersea telecommunications technologies were combined with unique enhancements to meet BP's requirements for the BP GoM FON. The system includes an 1,100 km, two optical fiber pair trunk cable between Pascagoula, Mississippi, and Freeport, Texas, outside the continental shelf with strategically located branching units to serve target platforms. The system is a hybrid of undersea technologies, incorporating a traditional long haul, optically amplified design on the trunk with repeaterless branches. Broadband optical add/drop multiplexing (OADM) branching units on the trunk provide bandwidth to each branch so that every primary platform has its own discrete path to both cable stations ashore, eliminating any interdependencies. This is accomplished using optical filters and 10 Gb/s optical transceivers on each platform mated with transceivers in each cable station operating at an assigned wavelength. The optical transceivers have a small form factor and low power requirements so the infrastructure requirements on each platform are modest. GigE interfaces on the platforms provide direct connection to onboard routers and local area network.

The mechanical connections to the platforms incorporated both mature as well as new features and solutions. BP's platforms are in water depths between 1200 and 2,000 meters and several required the installation of dynamic fiber optic risers. The technology deployed successfully on Petrobras was used again, although the individual platform interfaces required detailed engineering and their marine installation involved extensive planning and coordination. Critical to the riser design was the incorporation of newly revised hurricane design criteria based on the 2005 hurricane experience. Other platforms had available fibers incorporated into existing umbilicals, therefore, fiber

Tyco Decisive installing riser at Horn Mountain (left)

optic termination devices were deployed on the seafloor with connections made between the branch and riser using fiber optic jumpers. Deployment pallets serve as branch terminations utilizing wet mate connectors, a technology commonly used in the offshore industry, but rarely in undersea telecommunications.

Advanced Marine Installation

The 140 meter DP II CS Tyco Decisive deployed the trunk and branching units and made the branch connections to Nakika, Horn Mountain, Thunderhorse, Atlantis and Marlin in an initial campaign. The Decisive's DP II capability enabled it to operate safely inside the 500 meter safety zone for the platform cable landings and provided the precision positioning necessary to make the wet mate connections on the seafloor using a work-class ROV. The Decisive also installed crossing protection at pipelines, supported by the 80 m CS Teneo, which performed touchdown monitoring and other support tasks. The Tyco Dependable, sister ship to the Decisive, installed the branches and completed the final riser installations at Mad Dog and Holstein in a recently completed second campaign. The BP GoM FON is now fully operational, with traffic flowing from each platform to the diverse Freeport and Pascagoula shore stations and the BP operations center in Houston via diverse terrestrial fiber routes.

Poised for Growth

The BP GoM FON has several expansion modes which will enable it to serve additional existing platforms as well as new platforms when they come on line in the future.

The deployment of BP GoM FON included nineteen OADM branching units, seven of which were used to make the current connections to BP platforms, leaving twelve for expansion. The OADM branching units serve one or the other fiber pair, enabling BP to segregate users. The BP GoM FON design can support a maximum of 64 OADM branching units and primary platforms operating at 10 Gb/s. The system can accommodate a 300 km trunk addition as well as branching unit additions for platforms located up to 100 km from the trunk.

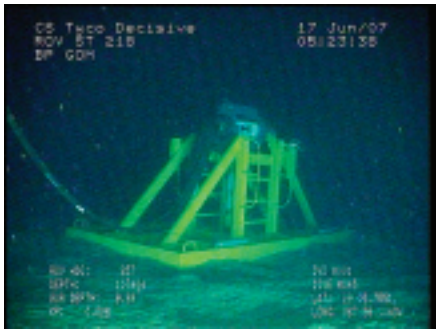
The system can also be expanded by subtending secondary platforms from the primary platforms. A second type of seafloor termination called a fiber distribution canister facilitates this type of connectivity by providing access to spare fibers in the risers, again via wet mate connectors.

The Long Haul

The BP GoM FON has a 25 year engineering life which, along with its flexible expansion capability, represents a long term growth, operations and maintenance commitment. The system requires little day to day intervention. BP is utilizing its own telecom operations and maintenance personnel to perform routine maintenance and respond to emerging events. Wet maintenance services are being obtained through the Atlantic Cable Maintenance Agreement (ACMA), a consortium of cable owners that has contracts with cable maintenance vessel operators for cable repairs on a call out basis.

Fiber and the Future

Oil and gas producers are beginning to recognize the benefits of fiber to offshore platforms, with BP GoM FON leading the way. On many levels, reliable bandwidth is a strategic investment that enables improved production, safety and quality of life. During storm events, platforms in the future may conceivably remain operational and uninterrupted or, if evacuation is required, stay online longer and return to production faster.



Subsea fiber optic termination utilizes wet mate connectors to facilitate system expansion

Operations are improved by better communications between platform personnel and management ashore. Real-time data enables transmission of all relevant parameters supporting analysis and decision-making. The health and welfare of platform personnel are also improved as all of the features of bandwidth, which are the norm ashore, can now be obtained offshore.

Reliable bandwidth also opens new doors. Seafloor telecommunications infrastructure can incorporate reservoir monitoring sensors and the bandwidth can accommodate the data flow to shore. There are many possibilities for automation, potentially some level of continued operation during storms.

Tyco Dependable backed up to Holstein

The automation concept can be extended to unmanned facilities, including wellheads and other production facilities that have no surface platforms at all.

With the deployment of the BP GoM FON, fiber to offshore platforms is no longer just a concept. The technologies exist, there are detailed methods for deployment and the long-term strategies for operations, maintenance and expansion are in place.

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